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The Dynamics of Trade Integration and Fragmentation in LAC

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The Dynamics of Trade Integration and Fragmentation in LAC
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ABSTRACT: Trade barriers and poor infrastructure play an important role in limiting trade integration in Latin America and the Caribbean (LAC). Closing half of the infrastructure gap between LAC and advanced economies could lift exports by 30 percent. Reducing import tariffs could boost LAC's trade, but its responsiveness is lower than in other EMDEs, particularly in the long run, due to the region's specialization in agricultural exports with inelastic demand and supply constraints like growing cycles and weather conditions. Amid deepening global trade tensions, LAC is well placed to withstand a mild trade fragmentation scenario, in which trade barriers are erected only among large economies. However, the region's output losses could be sizable in more extreme scenarios, where the global economy splinters into competing economic blocs and LAC loses access to important markets. Boosting trade, including regional trade, could pay a double dividend of lifting growth in the region while mitigating risks from global fragmentation.

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WORKING PAPERS

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1 Introduction

Latin America and the Caribbean (LAC) has been growing at a slow pace for the past decade. Could it grow faster by trading more? International trade is shown to be instrumental to growth, particularly in emerging markets and developing economies (EMDEs), where increases in trade have been associated with narrowing income gaps, reducing poverty, and improving living standards.[1] At the same time, LAC's openness to trade has lagged other fast growing economies, and, more recently, the region has failed to insert itself into global value chains (GVC), which have been shown to facilitate technological transfer, bringing countries closer to the innovation frontier.[2]

The global trade landscape is also evolving rapidly, presenting new opportunities as well as important challenges for LAC. The energy transition is expected to change the patterns of trade globally. While the region's fossil fuels exporters may be negatively impacted by the transition toward renewable sources of energy, countries endowed with large reserves of critical minerals could benefit substantially from expanding trade opportunities. On the other hand, geopolitical tensions, exacerbated by Russia's invasion of Ukraine, have resulted in an acceleration of harmful trade interventions and rising risks a broader fragmentation of international trade—i.e., a split of the global economy into a few economic blocs—that could have important implications for LAC.

This paper takes stock of the evolution of trade in LAC and sheds light on how the region could tap its trade potential in the changing global landscape, stressing the crucial role of investment and infrastructure. Specifically, this paper addresses the following questions: (i) How have the structure of LAC's trade and its degree of regional and global integration changed over time? (ii) How important are the potential gains from greater trade integration? And, on the other hand, (iii) How would global fragmentation affect the region, given its trade characteristics?

Our main contributions are threefold. First, we provide an overview of the current dynamics of trade in LAC, documenting five stylized facts: i) LAC's limited trade integration compared to many other regions; ii) the large share of commodities in LAC's exports, with China playing an increasing role as key destination; iii) LAC's limited integration into GVCs; iv) the major role of China as a source of LAC's capital goods imports; and v) the untapped potential in trade in services, especially in South and Central America. Second, we study some of the factors shaping LAC's trade patterns. In particular, we use a dynamic gravity framework to estimate new dynamic trade elasticities for LAC, and find that trade flows in LAC reacts less to changes in tariffs in the long run than in other regions. Third, in the context of increasing trade tensions, we provide several counterfactual analyses where we consider the dynamic implications of rising fragmentation risks, and, in particular, their impact through the capital channel.

Our paper is related to three strands of the literature. First, since the pioneering work of Anderson and van Wincoop (2003), gravity equations have served as a powerful organizing device for empirical trade analysis. Two papers are closely related to our work and have studied trade

[1] For the importance of trade for growth see Frankel and Romer (1999); Dollar and Kraay (2004); Bhagwati and Srinivasan (2002); Feyrer (2019); Goldberg and Pavcnik (2016); Bustos (2011).

[2] Acemoglu et al. (2015); Melitz and Redding (2021); Perla et al. (2021); Cai et al. (2022).

patterns in LAC using gravity models. Bhattacharya and Pienknagura (2024) study LAC's trade performance in recent years and estimates the salience of key country-specific factors in explaining underperformance in some sub-regions. Campos et al. (2023a) assess the evolution of globalization in the largest LAC countries and highlight heterogeneous globalization patterns across sectors compared to Asian countries. While gravity equations naturally emerge from theory, the measurement of trade elasticities has proved more challenging. A disconnect, dubbed "International Elasticity Puzzle" (Head and Mayer, 2014), has emerged between the empirical estimates of trade elasticities and what is required for general equilibrium models to match stylized facts. By taking a dynamic perspective and analyzing elasticities at different horizons, Anderson and Yotov (2023) provide a method to reconcile these two approaches. We contribute to this literature by applying a regional approach to Anderson and Yotov (2023) and comparing new dynamic trade elasticities in LAC to that in other regions.

Second, we contribute to a literature that quantifies the effects of trade policies using general equilibrium trade models. These models focus on the misallocation costs of trade frictions, and have been used to assess the economic impact of Free Trade Agreements (FTAs) such as NAFTA and Mercosur (Campos and Timini, 2022).[3] The canonical multi-sector model of Caliendo and Parro (2015), a Ricardian model with sectoral linkages and trade in intermediate goods, has become the workhorse model to compute welfare effects from changes in tariffs. In this paper, we use general equilibrium trade models to investigate new questions, such as calculating the gains from lowering trade barriers via better infrastructure in LAC and the consequences of geoeconomic fragmentation for the region.

Third, we speak to a fast-growing literature analyzing the economic impact of sanctions and the potentially large disruption of trade due to geopolitical concerns, dubbed "geoeconomic fragmentation" (IMF, 2019). Estimation of the costs of fragmentation typically rely on variants of the static framework of Caliendo and Parro (2015).[4] For instance, IMF (2023b) studies how fragmentation affects foreign direct Investment (FDI). In contrast, we take a dynamic perspective to trace out the impact of fragmentation over time, given the importance of capital accumulation and infrastructure in the region. We leverage the framework in Ravikumar et al. (2019), a dynamic, multicountry Ricardian model based on Alvarez (2017)'s two-sector neoclassical growth model, where international trade affects the cost of capital and investment rates, consistent with empirical findings.[5] As as result, geoeconomic fragmentation can depress growth by inducing countries to reduce investment.

The rest of the paper proceeds as follows. Section 2 describes the databases used in our analysis. Sections 3 and 4 summarize the structure of trade in LAC and the region's recent trade policies, respectively. Section 5 estimates the output gains from lowering trade-related infrastructure, and Section 6 assesses how trade in LAC respond to tariffs in the short and long run. Section 7 studies the consequences of trade fragmentation for the region. Finally, Section 8 concludes.

[3] Risk sharing is another potential channel of gains from trade, see Allen and Atkin (2022).

[4] Alternatively, Baqaee (2024) considers a richer setting allowing for different wedges and frictions in a static network model of international trade.

[5] Other dynamic trade models include Larch et al. (2016) and, more recently, Cuñat and Zymek (2022).

2 Data

This paper uses trade data from different sources. The IMF's Balance of Payments (BoP) database contains information on the total trade of goods and services across countries. The IMF's Direction of Trade Statistics (DOTS) has information on bilateral merchandise trade flows across all IMF member states starting in 1946. CEPII's Base pour l'Analyse du Commerce International (BACI) data (Gaulier and Zignago, 2010) has bilateral merchandise trade flows for 200 countries at the Harmonized System 6-digit level. Data on bilateral trade in services are from the WTO-OECD Balanced Trade in Services (BaTIS) database. Lastly, the ITPD-E (Borchert et al., 2020a) contains consistent data on both international and *domestic* trade at the industry level covering agriculture, mining, energy, manufacturing, and services from 2000 to 2019.

Information on gravity variables and other trade policies comes from several sources. Data on each country's economic, geographical, and cultural characteristics are from CEPII's Gravity database (Conte et al., 2022). Some examples are countries' GDP and population, their bilateral geographical distance, and dummies for common language, land border and whether a country is landlocked. Data on bilateral trade agreements and tariffs are from both CEPII's Gravity database and the UNCTAD TRAINS database, data on importer's trade-weighted merchandise MFN tariffs are from the World Bank's World Development Indicators, and data on non-tariff trade barriers are from Estefania-Flores et al. (2022).

Data on key GVC indicators for 189 countries from 1990 to 2018 are from the UNCTAD-Eora GVC database. Data on input-output databases are from the World Input-Output Tables (Timmer et al., 2015) covering 43 countries and a rest of the world, 56 sectors according to the ISIC Rev. 4, and over the period of 2000-2014. Data on infrastructure, governance, and human capital are obtained from WB's LPI, WB's Enterprise Survey, and the Penn World Tables revision 10.1, respectively.

3 The Evolution of LAC's Trade

This section documents stylized facts on the structure and evolution of LAC's trade.

Fact 1: *LAC's trade integration lags that of many other regions, pointing to substantial untapped potential.*

Despite some progress in increasing trade integration—LAC's trade in goods and services with the rest of the world increased from about 30 percent of GDP in 1995 to 47 percent in 2019—the region remains behind other EMDEs (Figure 1, left panel).[6] This is especially noticeable for South America. LAC's low degree of integration is also visible in terms of intra-regional trade, which stands at a modest 14 percent of total goods trade, significantly below that of Europe and Central Asia and East Asia and the Pacific, and comparable to Sub-Saharan Africa (Figure 1, right panel).

[6] The terms "trade integration" and "trade openness" are used interchangeably to refer to a country's share of GDP traded internationally.

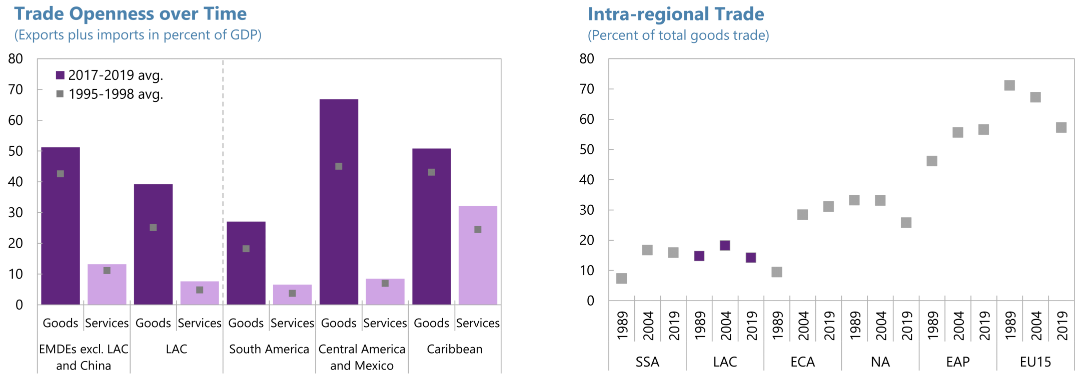


Figure 1: The Evolution of LAC's Trade Integration

Notes: EMDEs excl LAC and China = Emerging and Developing Asia and Europe excluding China. EAP = East Asia and Pacific; ECA = European and Central Asia; EU15 = European Union 15 extended; NA = North America; SSA = Sub-Saharan Africa. Left panel includes intra-regional trade. *Sources:* IMF BOP database; IMF DOTS; and IMF staff calculations.

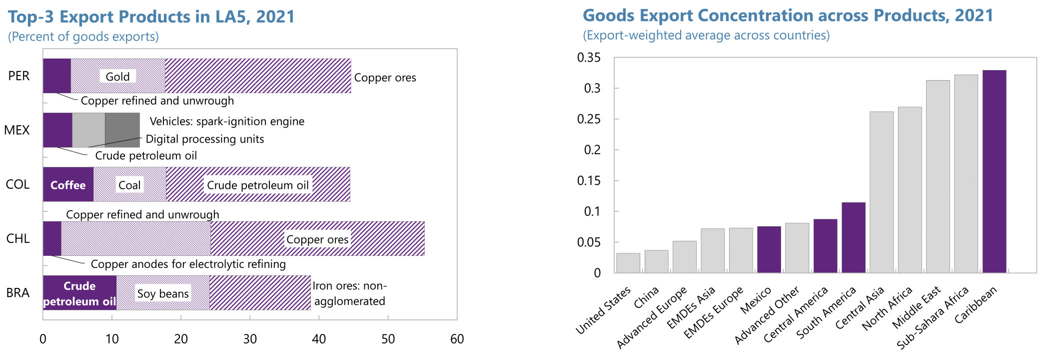


Figure 2: LAC's Exports Across Products and Industries

Notes: LA5 = Latin America 5 (Brazil, Chile, Colombia, Mexico, Peru). Advanced Europe = Advanced Economies in Europe. Advanced Other = Advanced Economies excluding Europe and the US. Export concentration measured as the Herfindahl–Hirschman Index (HHI) at the HS-3 product codes. For each country, the index is calculated as the sum of the squares of export shares of each product. *Sources:* BACI and IMF staff calculations.

Fact 2. *Commodities take up a large share of LAC's exports, and China is playing an increasing role as a key consumer of exports from the region.*

Primary commodities account for the bulk of LAC's goods exports. Except for Mexico, the top export products of the largest economies of the region are primary commodities, consistently accounting for over 40 percent of merchandise exports (Figure 2, panel 1). The region's goods exports remain concentrated more broadly (Figure 2, panel 2). The Caribbean's exports are the most concentrated, reflecting a high dependence on agricultural products. South America's exports are more concentrated than Asian and European EMDEs, although less than those of Africa and Central Asia. Export concentration in Central America and Mexico is in line with other EMDEs reflecting more diversified manufacturing base.

Besides intra-regional trade, the US and China are the largest export destinations for LAC's

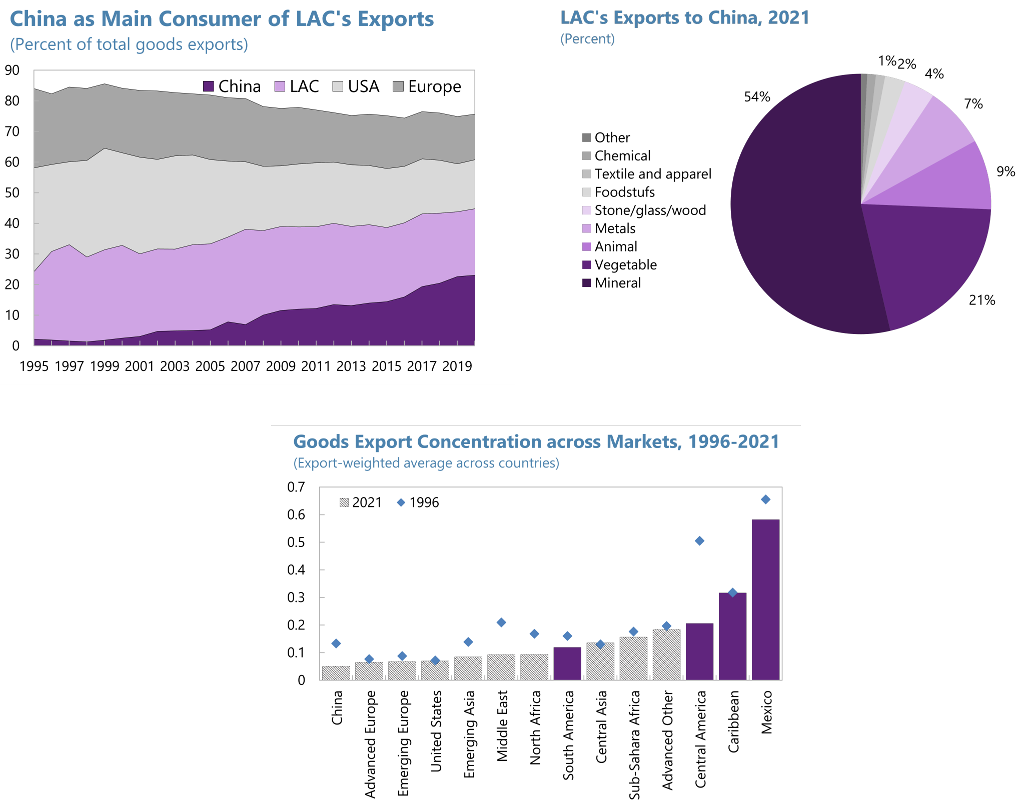


Figure 3: Geographical Composition of LAC's Exports and the Role of China

Notes: The figure reports exports of LAC excluding Mexico. The growing role of China as a destination for LAC's products is also present when including Mexico in the analysis. Advanced Europe = Advanced Economies in Europe. Advanced Other = Advanced Economies excluding Europe and the US. Export concentration measured as the HHI across export destinations. For each country, the index is calculated as the sum of the squares of export shares of each export destination. *Sources:* BACI and IMF staff calculations.

goods. Over the last 25 years, China's share of LAC's goods exports (excluding Mexico) increased tenfold, from near zero in 1996 to over a fifth in 2021, while the combined share of advanced Europe and the US was reduced in half over the same time period, from 60 to about 30 percent (Figure 3, top-left panel).[7] By 2018, China became the main consumer of LAC's products, excluding Mexico—with exports to China heavily concentrated in mineral (about half of exports), vegetable (20 percent), and animal (10 percent) primary products (Figure 3, top-right panel). The share of intra-regional exports has remained steady at about $\frac{1}{4}$ of total goods exports during 1996-2021. More broadly, despite improvements in market share diversification over time, Central America, the Caribbean, and Mexico's exports remain more concentrated across destinations than most other regions in the world, partly due to their strong trade ties with the US (Figure 3, bottom panel).

Fact 3. *LAC's integration into GVCs remains limited.*

[7] In contrast, Caribbean exports to China have not markedly increased, and indeed declined during the period 2006-09, a "missed opportunity" for the Caribbean according Bernal (2015).

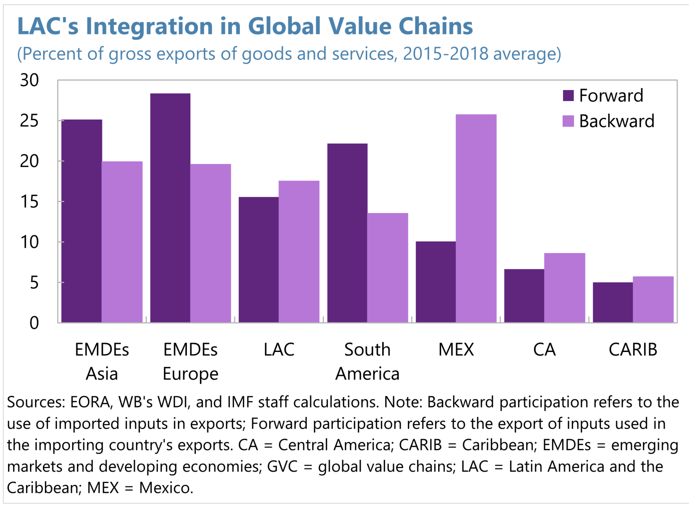


Figure 4: LAC's integration in GVCs

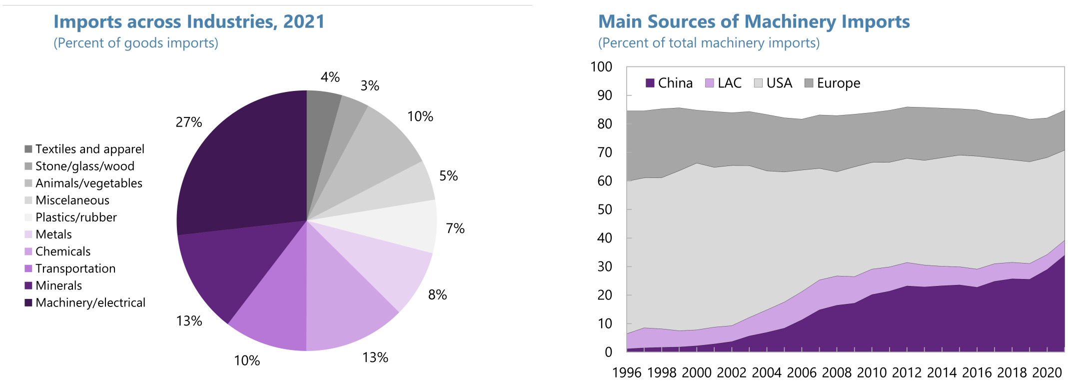


Figure 5: The Industrial and Geographical Composition of LAC's Goods Imports

Sources: BACI and IMF staff calculations.

Both the region's average backward participation (i.e., the use of imported inputs in LAC's exports) and forward participation (i.e., the use of LAC's exports as inputs in other countries' exports) stand below other Asian and European EMDEs. Within LAC, however, there is some heterogeneity: (i) South America, where several countries are commodity exporters, have levels of forward participation in line with other EMDEs, although lower levels of backward participation;[8]

(ii) Mexico stands out for its high backward participation in manufacturing (reflecting the high import content of its exports) but low forward participation (reflecting that much of its manufactures are exported to the US as final destination); (iii) Central America and the Caribbean are regions with little GVC integration on both dimensions.

[8]Commodity exporters tend to have larger forward participation, as their production is less dependent on imported inputs and they export primary goods that enter as inputs in other countries' exports (e.g., Chile exports raw copper to China, who refines it and then exports copper-based products).

Fact 4. *LAC's merchandise imports are concentrated in capital goods, with China playing a key role as a provider of these goods.*

Capital goods (in the form of machinery, electrical, and transportation products) account for over 1/3 of the region's imports of goods (Figure 5, left panel), with China becoming a main source of these products over time (Figure 5, right panel). Accompanying the growing role of China, the share of imports from the US has decreased from around 50 percent in 1996 to nearly 30 percent in 2021. As of 2021, LAC's machinery imports from China represent 8 times Germany's total machinery exports and 14 times Japan's total machinery exports. Besides being a large supplier of LAC, China exports to the region products that cannot be easily replaced by products from other origins, as the product composition of imports from China is very dissimilar to the composition of imports from other countries except the US.[9]

Fact 5. *LAC's trade in services is low, particularly within the region.*

At the global level, the share of services to total trade has been rising and reaching close to a quarter of world trade in 2019 (WTO, 2020). Meanwhile, in LAC, services only account for about 15 percent of total trade, a share that has stayed constant since the 1990s (Figure 6, left panel). This share rises to about 40 percent in the Caribbean, where tourism-related travel and transportation account for the bulk of services exports and imports respectively. The region's largest economies and top exporters of commercial services, Brazil and Mexico, only stand at the 35th and 36th global ranks for the global value of services exported (WTO, 2023). Most services exports from LAC are destined to North America, and intra-LAC trade in services is lower than in relevant peers' groups, with only about 11 percent of services exports directed to other LAC countries, compared to about half in European or in East Asian peer regions (Figure 6, right panel).

4 The Evolution of Trade Policy in LAC

LAC has made substantial progress in reducing import tariffs over time, despite heterogeneities across LAC's subregions and trade partners. Looking ahead, the broad decline in LAC's barriers to trade faces challenges related to non-tariffs trade barriers and climate concerns.[10]

4.1 Declining Tariffs

LAC has significantly lowered its import tariffs and ratified over 300 trade agreements since 1996, reflecting a global trend of declining tariffs on goods and services, particularly noticeable between

[9] LAC's imports from origins other than the US have a low Spearman correlation index to imports from China. This index captures the correlation of export shares across products of different origins: $\text{Spearman}_i = 100\frac{\sum_p s_{i,p}s_{CHN,p}}{\sqrt{\sum_p s_{i,p}^2}\sqrt{\sum_p s_{CHN,p}^2}}$ where $s_{i,p}$ denotes the share of LAC's imports of product p from country i such that $\sum_p s_{i,p} = 1$. An index of 100 indicates that LAC's imports from country i have the same product structure than LAC's imports from China.

[10] For a complete treatment of the interaction between trade and climate policy in developing countries see Brenton and Chemutai (2021) and Perdana and Vielle (2022)

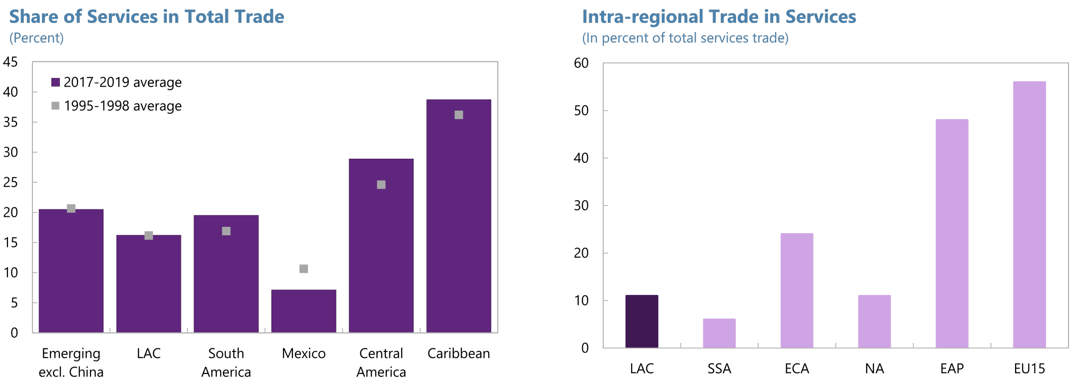
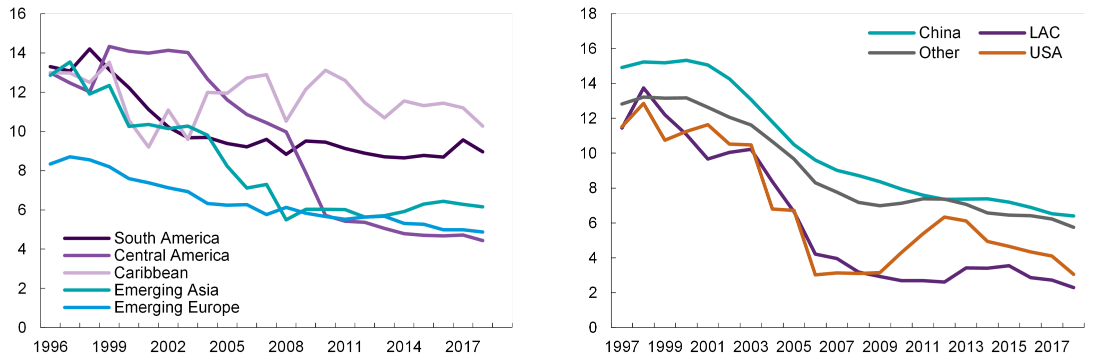


Figure 6: LAC's Trade in Services

Notes: CA = Central America; EAP = East Asia and Pacific; ECA = European and Central Asia; EU15 = European Union 15 extended; NA = North America; SSA = Sub-Saharan Africa. Left figure includes intra-regional trade. *Sources:* IMF BOP; IMF DOTS; WTO-OECD BaTIS, and IMF staff calculations.



a) Most-Favored Nation Tariffs

b) LAC's Effective Import Tariffs by Partner

Figure 7: The Evolution of Tariffs in LAC

Notes: In percent. Panel a) Weighted by imports. Panel b) represents three-year moving averages. Effectively applied tariff is the lowest available tariff rate for each country pair. Preferential tariffs are used for trade flows in a regional trade agreement. *Sources:* ITPD-E; UNCTAD TRAINS; and IMF staff calculations.

the 90s and the Great Financial Crisis. However, a divergence has appeared across LAC's subregions. In South America and the Caribbean, the reduction in Most Favored Nation (MFN) import tariffs has stalled since the late 2000s. In contrast, MFN tariffs in Central America fell by up to 8 percentage points on average, reaching levels similar to those observed in other EMDEs (Figure 7, left panel). Importantly, not all trading partners have been subject to the same tariff evolution. Regional trade agreements like Mercosur, NAFTA-USMCA and the Andean Community have played important roles in simplifying regional trade policies and lowering tariffs applied to neighboring countries. At the same time, the tariffs that LAC effectively imposed on China and other trade partners have not fell as much. For instance, import tariffs with China stagnated between 6 and 8 percent since 2010. (Figure 7, right panel).

FTAs have also accelerated convergence of tariff schedules among their signatories. Tariff sched-

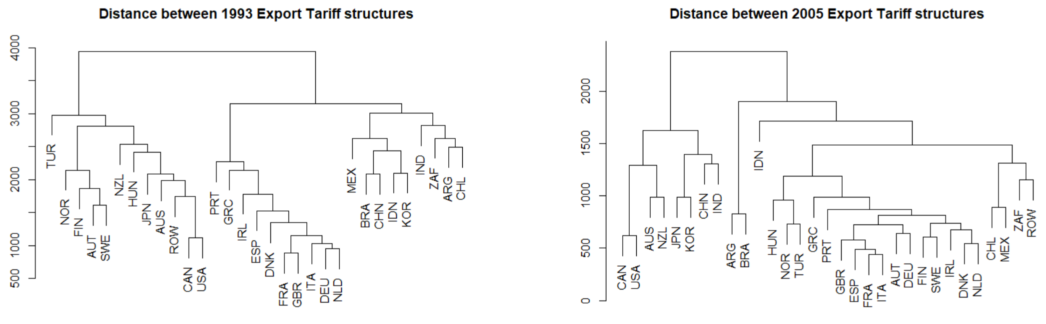


Figure 8: Proximity of Tariff Schedules

Notes: Authors' calculations using UNCTAD-TRAINS Data from Caliendo and Parro (2015). The proximity of tariff schedules is computed using hierarchical cluster analysis, where the distance between tariffs structure is calculated as the sum of absolute differences (Minkowski distance) in percentage points. The tariff measures are the tariff lines effective applied rates at the tariff line level. A simple average is then taken in each of the 20 tradeable sectors of the 2-digit ISIC Rev. 3 nomenclature. Effective applied rates refers to the actual tariff applied, taking into account whether there is any trade agreement between the countries.

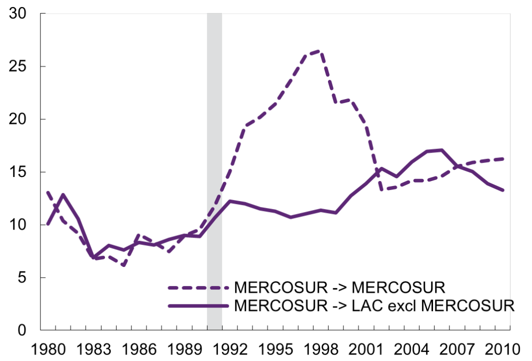
ules are highly complex objects, with different rates covering a multitude of products. For instance, the complete tariff schedule of Mexico covers thousands of tariff lines over more than 300 pages.[11] A major advantage of customs unions and free trade areas is to drastically simplify and harmonize these schedules. For instance, Mercosur members have to adopt Mercosur's Common Nomenclature, a coding system to harmonize the description of tradable goods, and Mercosur's Common External Tariffs (CET).[12] Figure 8 measures the distance between countries' tariff schedules at the product level. Between 1993 and 2005 most tariffs structures have converged, as tariffs have generally declined. Furthermore, the tax schedules of LAC countries have grown much closer with others. For instance, the tariff schedules of Argentina and Brazil in 2005 have become as closed as Canada's and USA's were in 1993.

FTAs also insulate against unilateral tariff increases, which have become more frequent in the past few years, as such increases are usually precluded from the agreement. For instance, Mexico raised import tariffs on steel and 392 other products in August 2023 and only countries with no pre-existing trade agreements with Mexico were affected.[13]

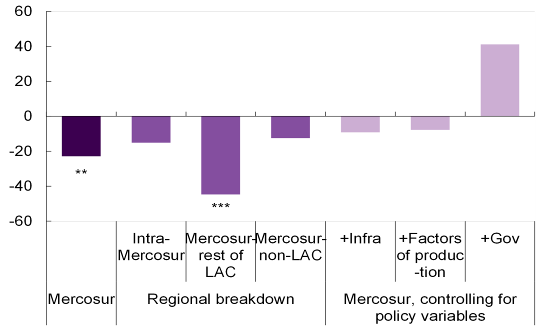
[11] See for instance Mexico's tariff schedule in 2012 here.

[12] While many exceptions in the original CET have been overruled, some related to preexisting bilateral tariff agreements, its implementation is still incomplete and Mercosur's countries' tariff schedules are not fully aligned with the CET. See Laens and Terra (2005) for further details on the CET.

[13] Decreto por el que se modifica la Tarifa de la Ley de los Impuestos Generales de Importación y de Exportación, Diario Oficial de la Federación 15/08/2023.



a) Exports from Mercosur to Mercosur and to rest of LAC



b) MERCOSUR's Goods Trade Performance

Figure 9: Mercosur's Trade Performance

Notes: Panel a) in percent of goods trade. Panel b) Percent difference in trade flows in Mercosur vs. non-LAC regions, conditional on population, GDP, distance, border, common language, landlocked, MFN tariffs, trade agreements and non-tariff trade barriers. ***p<1%, **p<5%, *p<10%. MERCOSUR = Mercado Común del Sur (ARG, BRA, PRY, URY). *Sources:* IMF DOTS and IMF staff calculations.

4.2 Trade Agreements and Integration: The case of Mercosur

Established in 1991 by the Treaty of Asunción, Mercosur is a trade bloc consisting of Argentina, Brazil, Paraguay, and Uruguay,[14] with the aim of promoting trade integration and economic cooperation among its member countries. Upon implementation, member countries agreed to gradually reduce most of their bilateral tariffs to zero, to establish a common external tariff framework and to become a customs union by 1995.

Mercosur initially succeeded in improving trade and output of its member countries. Upon implementation, trade flows between member countries outpaced trade flows between Mercosur and non-Mercosur countries (Figure 9, left panel), consistent with gravity-model estimates in the literature[15] —pointing towards sizable output and welfare gains from the trade agreement. However, these trade gains appear to have been short-lived, as the extent of trade among Mercosur countries converged back to the level of trade between Mercosur and the rest of LAC by the mid-2000s. The gains have also been heterogenously distributed among countries (Campos and Timini, 2022).

We implement the gravity framework of Bhattacharya and Pienknagura (2024) to compare the trade performance of Mercosur with to regions with similar economic and geographic characteristics (Figure 9, right panel). Three findigns stand out. First, Mercosur trades about 25 percent lass than peer regions. Second, the strong under-performance in trade flows happens between Mercosur and the rest of LAC, and not so much within Mercosur or between Mercosur and non-LAC countries. This suggests that an important limitation of the trade agreement was to not achieve greater

[14] On 28 November 2023, the Brazilian Senate approved the draft Legislative Decree PDL 380/2023 to accept the Plurinational State of Bolivia as a full member state of the South American Common Market trading block (MERCOSUR). Venezuela is a full member but has been suspended since 1 December 2016.

[15] See Baier et al. (2007), Kohl (2014), Baier et al. (2019), El Dahrawy Sánchez-Albornoz and Timini (2021), Campos and Timini (2022).

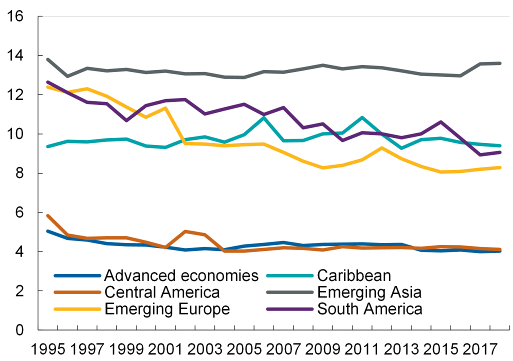


Figure 10: Non-tariff Barriers. Average MATR weighted by goods imports

Notes: Author's calculations based on Estefania-Flores et al. (2022). Measure of Aggregate Trade Restrictions (MATR) is an empirical measure of how restrictive official government policy is towards the international flow of goods and services, developed by IMF authors.

integration between its members and the rest of LAC. Third, policy variables related to transport infrastructure, customs efficiency, and the quality of factors of production and governance explain the bloc's current trade performance. In other words, after controlling for each of those factors, there is no longer a statistical difference between Mercosur's trade performance and other regions with similar economic and geographic characteristics.

4.3 Beyond Tariffs: the Role of Non-tariffs Trade Barriers

Increasingly, it is recognized that trade policy is not limited to tariffs, with tools such as quotas and regulations playing an important role. A WTO Agreement on Technical barriers to trade specifies the exceptions in which rules, regulations, and standards can be used to pursue "legitimate objectives" such as "national security requirements; the prevention of deceptive practices; protection of human health or safety, animal or plant life or health, or the environment". Deep FTAs can help reduce these barriers to trade, particularly for LAC, which has signed 74 such agreements in the past 20 years (Rocha and Ruta, 2022).

In contrast to the broad decline in LAC's tariffs, non-tariff Trade Barriers (NTBs) have stayed stubbornly high in most subregions, as measured by the Measures of Aggregate Trade Restrictions (MATR).[16] Central America is one exception, with NTBs on par with advanced economies (Figure 10). NTBs particularly affect sectors such as agriculture, where they often take the form of sanitary and phytosanitary measures, or the services sector, where various regulatory hurdles prevent foreign firms from effectively accessing domestic markets. Importantly, a group of Andean countries —Ecuador, Chile, Colombia, and Peru—have successfully reduced trade barriers in services between 2008 and 2016 (Borchert et al., 2020b).

[16] See Estefania-Flores et al. (2022).

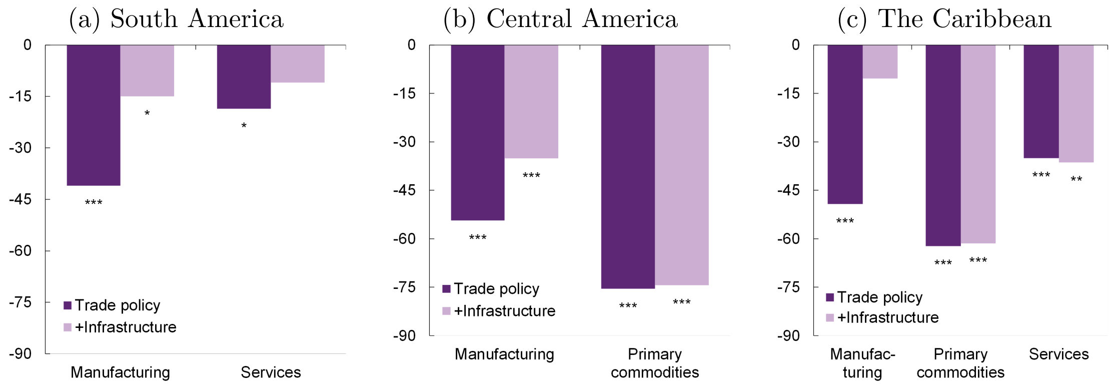


Figure 11: Trade Gaps for Different Regions and Model Specifications

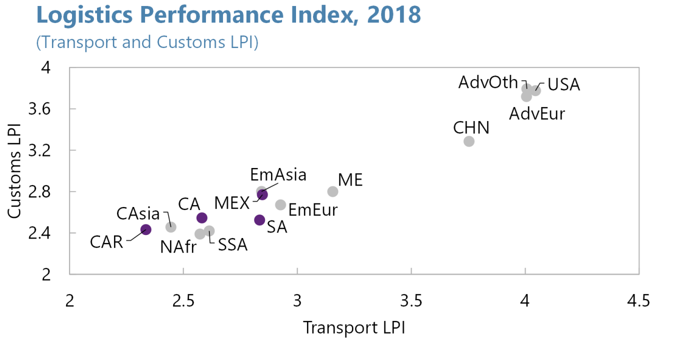
Notes: Percent difference in each region's trade flows relative to non-LAC trade flows, conditional on population, GDP, distance, border, common language, landlocked, and trade policies. Each plot analyzes each subregion in LAC: South America, Central America, and the Caribbean. Light purple columns additionally control for infrastructure (both physical and customs). ***p<1%, **p<5%, *p<10%. *Source:* Bhattacharya and Pienknagura (2024).

5 LAC's Trade Performance: The role of infrastructure improvements

Trade policy, infrastructure, human capital and governance are key factors shaping LAC's trade performance, with the relative importance of each factor varies by country. Arena et al. (2023) and Corugedo et al. (2023) have shown that trade policy, as well as structural policies related to human capital, governance, and infrastructure, are important drivers of trade volumes and diversification in Colombia, Guatemala, and Trinidad and Tobago, respectively. Bhattacharya and Pienknagura (2024) provide a broad assessment of the main obstacles to trade in LAC as a whole, in LAC's subregions, and across sectors. They estimate a partial equilibrium gravity model of trade, provide evidence that LAC under-trades in manufacturing relative to peer regions, and show that infrastructure gaps are a key reason for the LAC's poor trade performance (Figure 11).

There are sizeable infrastructure gaps between LAC and other EMDEs and AEs. Infrastructure is understood for the purpose of this study in a broader sense encompassing both physical and customs infrastructure. Countries with a low Transport LPI—which measures, inter alia, the quantity and quality of physical infrastructure—tend to have low Customs LPI—which measures, among other things, processing times for customs clearance. Most Latin American countries have taken advantage of the commodity boom in the 2000s and 2010s to undertake large infrastructure investments. Yet a significant infrastructure gap remains with other regions, such as Emerging Asia or Eastern Europe. This begs the question: what are the potential gains from trade if LAC could close its infrastructure gaps relative to other regions?

To estimate these gains, we embed the gravity model in Bhattacharya and Pienknagura (2024) into a Anderson and van Wincoop (2003) general equilibrium trade model and allow infrastructure (together with governance and human capital) to affect international trade costs (Donaubauer et al., 2018). In the model, each country produces a unique variety using a fixed supply of labor as only input. Consumers have CES preferences over goods from different countries, so these varieties are



Sources: IMF staff calculations. Notes: Aggregates are GDP-weighted. LPI = Logistics Performance Index; AdvEur = Advanced Europe; AdvOth = Advanced Other; CA = Central America; CAR = Caribbean; CAsia = Central Asia; EmAsia = Emerging and Developing Asia; EmEur = Emerging and Developing Europe; LPI = Logistics Performance Index; ME = Middle East; NAfr = North Africa; SA = South America; SSA = Sub-Saharan Africa.

Figure 12: Logistics Performance Index

imperfect substitutes. The CES assumption implies a love for variety, which is the motive for trade to exist in equilibrium (Armington, 1969). We assume there are iceberg trade costs to ship goods across countries. In equilibrium, total world production equals total exports for all countries in the world. The equilibrium equations of the model are:

$$X_{ij} = \frac{Y_i E_j}{Y} \left(\frac{t_{ij}}{\Pi_i P_j} \right)^{1-\sigma} \tag{1}$$

$$\Pi_i^{1-\sigma} = \frac{\Sigma_j \left(\frac{t_{ij}}{P_j} \right)^{1-\sigma} E_j}{Y} \tag{2}$$

$$P_j^{1-\sigma} = \frac{\Sigma_i \left(\frac{t_{ij}}{\Pi_i} \right)^{1-\sigma} Y_i}{Y} \tag{3}$$

$$p_i = \frac{\left(\frac{Y_i}{Y} \right)^{\frac{1}{1-\sigma}}}{\alpha_i \Pi_i} \tag{4}$$

$$E_i = \phi_i Y_i = \phi_i p_i Q_i, \tag{5}$$

where X_{ij} denotes the trade flows between exporter (or origin) i and importer (or destination) j, Y denotes output in real terms, E denotes expenditure, t_{ij} represents the iceberg trade cost from i to j, Π_i and P_j denote the outward and inward "multilateral resistance" terms, respectively, σ is the elasticity of substitution among goods from different countries, α is the CES preference parameter, p_i is the factory-gate price for each good country i produces, Q_i is the fixed endowment supplied by producers and ϕ represents the trade deficit.

We estimate the model and counterfactuals in three steps, following Larch et al. (2016). The first step estimates trade costs in a partial equilibrium gravity framework. Taking logs on both sides of the Equation (1), we obtain:

$$\log(X_{ij}) = \log\left(\frac{1}{Y}\right) + \log\left(\frac{Y_i}{\Pi_i^{1-\sigma}}\right) + \log\left(\frac{E_j}{P_j^{1-\sigma}}\right) + \log\left(t_{ij}^{1-\sigma}\right) \tag{6}$$

We allow for infrastructure, human capital and the quality of governance of countries ($Z_i = [Infra_i, H_i, Gov_i]$) to affect bilateral trade costs (t_{ij}), which are also determined by other standard gravity variables, including geographic distance and contiguity, import tariffs, and regional trade agreements:

$$\begin{aligned} t_{ij}^{1-\sigma} = \exp[&\beta_1 log(DIST_{ij}) + \beta_2 CONTIG_{ij} + \beta_3 log(TARIFF_{ij}) \\ &+\beta_4 RTA_{ij} + \beta_5 INTL_{ij} + \beta_6 INTL_{ij} \cdot Z_i] \end{aligned} \tag{7}$$

where $INTL_{ij}$ is an international border dummy (i.e., $INTL_{ij} = 1$ if $i \neq j$). These assumptions deliver an estimable partial equilibrium gravity equation:

$$\begin{aligned} X_{ij} = \exp[&\alpha_i + \alpha_j + \beta_1 log(DIST_{ij}) + \beta_2 CONTIG_{ij} + \beta_3 log(TARIFF_{ij}) \\ &+\beta_4 RTA_{ij} + \beta_5 INTL_{ij} + \beta_6 INTL_{ij} \cdot Z_i] \times \epsilon_{ij} \end{aligned} \tag{8}$$

In order to consistently estimate the trade costs, we include exporter and importer fixed effects to control for the multilateral resistance terms, $\log\left(\frac{Y_i}{\Pi_i^{1-\sigma}}\right)$ and $\log\left(\frac{E_j}{P_j^{1-\sigma}}\right)$, which are not observed (Hummels et al., 2001; Feenstra, 2015). These fixed effects prevent us from including country-specific variables in the regression, only when interacted with the international border dummy. Consequently, our specification builds upon the reduced form in Bhattacharya and Pienknagura (2024), as all exporter- and importer-specific variables are non-parametrically controlled for by the exporter and importer fixed effects. We estimate the model with PPML to account for the large number of zero trade flows, following Santos Silva and Tenreyro (2006). The main coefficient of interest, β_6, tests whether infrastructure, human capital, or the quality of governance affect international trade costs. Because domestic trade flows are included and these variables are interacted with the border dummy, $INTL_{ij}$, our main coefficient of interest assesses by how much better infrastructure, human capital, or governance improve international trade flows relative to domestic trade flows (Campos and Timini, 2022).

Table 1 displays the main regression coefficients. In line with the literature, we estimate that lower distance, contiguity, lower import tariffs, and regional trade agreements are all associated with more trade. When included one at a time, better infrastructure, better human capital, and better governance are all associated with more international trade relative to domestic trade. When infrastructure, human capital, and governance are included at the same time, we find both infrastructure measures to be more strongly associated with international trade flows.

After estimating the regression coefficients, we back out estimates for the trade costs using Equation (6) and assuming $\sigma = 5$, in line with the literature. The second step then solves Equations

Table 1: Gravity Model Regressions

Dep. Var: Trade flows	(1)	(2)	(3)	(4)	(5)	(6)
Distance	-0.454***	-0.417***	-0.453***	-0.501***	-0.389***	-0.363***
	(0.122)	(0.0927)	(0.0979)	(0.103)	(0.0878)	(0.0810)
Contiguity	0.579***	0.605***	0.602***	0.582***	0.617***	0.652***
	(0.211)	(0.178)	(0.182)	(0.181)	(0.177)	(0.173)
Border	-2.937***	-8.218***	-6.501***	-3.227***	-10.62***	-11.22***
	(0.356)	(0.556)	(0.540)	(0.315)	(1.190)	(1.157)
ln(Tariff)	-6.114***	-3.464***	-3.194**	-3.091**	-3.270***	-2.856***
	(2.096)	(1.245)	(1.265)	(1.281)	(1.147)	(1.025)
Trade agreement	0.316**	0.342***	0.349**	0.249**	0.388***	0.460***
	(0.154)	(0.109)	(0.140)	(0.124)	(0.112)	(0.107)
Physical infra x Border		0.876**			0.776*	0.787*
		(0.439)			(0.453)	(0.459)
Customs infra x Border		0.584			0.953+	1.019*
		(0.479)			(0.612)	(0.599)
Human capital x Border			1.107***		0.522**	0.594**
			(0.141)		(0.252)	(0.272)
Governance x Border				0.790***	-0.451*	-0.588**
				(0.114)	(0.233)	(0.298)
Constant	17.25***	17.04***	17.27***	17.55***	16.88***	16.74***
	(0.802)	(0.607)	(0.636)	(0.670)	(0.575)	(0.531)
Obs.	44509	33085	30738	40628	28662	24260

Notes: Gravity regression coefficients from Equation (8). Border denotes the $INTL_{ij}$ dummy. Column (6) additionally controls for the interaction between GDP per capita in 2017 and border dummy. Standard errors clustered at country of origin in parentheses. +p<.20, *p<.10, **p<.05, ***p<.01. *Sources:* IMF staff calculations.

(1) – (5) and calculates baseline levels of trade flows and output in equilibrium. Finally, the third step compares the outcomes in the baseline equilibrium with outcomes in counterfactual equilibria where we improve LAC's infrastructure conditions.

The main counterfactual in this section artificially increases infrastructure conditions in each LAC country such that the infrastructure gap relative to the average advanced economy is reduced by 10, 20, and 50 percent. These lower the cost of trading with LAC, as the coefficients associated with both infrastructure measures in Table 1 are positive. Consequently, the region's exports would

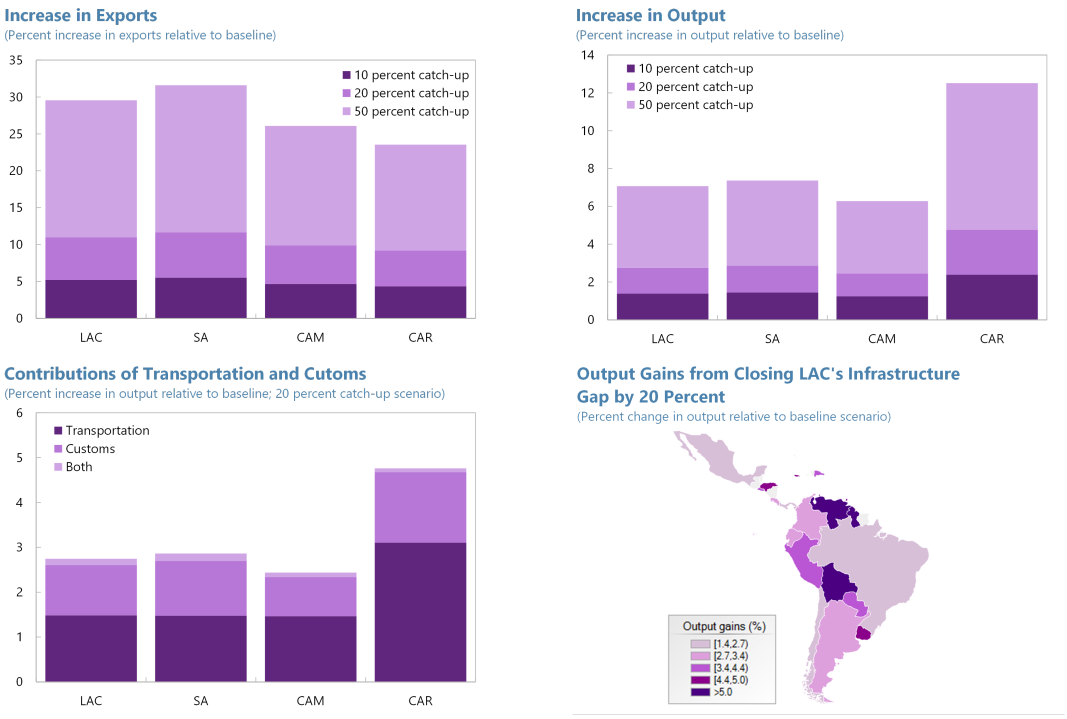


Figure 13: Infrastructure Improvements and the Gains from Trade in LAC

Notes: CA = Central America including Mexico; CAR = Caribbean; SA = South America. *Disclaimer:* The boundaries, colors, denominations, and any other information shown on the maps do not imply, on the part of the International Monetary Fund, any judgment on the legal status of any territory or any endorsement or acceptance of such boundaries. *Sources:* IMF staff calculations.

increase by 5, 11, and 30 percent, respectively, as the reduction in trade costs increases demand for the region's exports (Figure 13, top-left panel). Lastly, the top-right panel in Figure 13 shows that LAC's output would increase by 1.5, 2.5, and 7 percent, respectively, in response to larger global demand for the region's products.

Both dimensions of infrastructure contribute substantially to the gains from trade. Figure 13, bottom-left panel shows that closing the infrastructure gap by 20 percent would lift LAC's output by 2.8 percent, with improvements in transportation infrastructure responsible for 1.5 percentage points (pp), improvements in customs efficiency for 1.1 pp, and 0.2 pp due to the interaction between the two types of infrastructure (i.e., transport infrastructure gains are larger when there is better customs efficiency). Moreover, Figure 13 bottom-right panel shows that the output gains are quite heterogeneous across countries, ranging from 1.5 to 6 percent, depending on the extent of initial infrastructure gaps and the extent to which countries in the region are close to large trading partners.

A wide range of policy actions could help close infrastructure gaps. The World Bank's Logistics Performance Index (LPI), used to capture infrastructure in the analysis, points to several policies that could help improve infrastructure and boost trade in LAC, including: (i) streamlining, automating, and digitizing customs procedures, reducing bureaucratic red tape, and enhancing transparency in trade processes; (ii) investing in the quantity, the quality, and the integration of different transport modes, and improving transport-related technologies such as digital tracking systems; (iii) developing a logistics sector with efficient freight forwarding, warehousing, and providers by encouraging competition and fostering Public-Private Partnerships; and (iv) training customs and transportation personnel to enhance their skills.

One important caveat is that large infrastructure improvements may imply potentially large financial and environmental costs. Implementing these policies would require a case-by-case analysis of key bottlenecks that need to be prioritized, while observing fiscal policy constraints and leveraging private investment when available, as well as correctly assessing the risks to environmental services and to biodiversity (UNEP, 2022).

6 Dynamic Trade Elasticities: Comparing LAC to peer regions

The analysis thus far focused on static (or long run) gains from reducing trade costs by improving infrastructure conditions. However, gains from trade might take time to materialize, as countries slowly form links with each other and infrastructure improvements gradually expand the capacity to serve increased foreign demand. In this section, we compare how trade in LAC responds to lower tariffs relative to trade in peer regions in the short and long run.

We use the novel methodology from Anderson and Yotov (2023) to test how trade elasticities vary over time horizons and across regions. The authors build on a vast international trade literature[17] that assumes bilateral links between countries evolve dynamically over time. They show that, if firms take time to invest in capacity to connect to and serve other destinations, the following dynamic gravity equation arises:

$$X_{ijt} = \frac{Y_{it}E_{jt}}{Y_t}\left(\frac{t_{ijt}}{\Pi_{it}P_{jt}}\right)^{1-\sigma}\lambda_{ijt}^{1-\rho} \tag{9}$$

Relative to Equation (1), the new term $\lambda_{ijt}^{1-\rho}$ captures origin-destination specific bilateral capacity for trade. The variable λ_{ijt} measures the efficiency of existing trade shares between i and importer j in year t and ρ captures how frequent countries can adjust their capacity and modify their desired trade links.[18] This new term affects directly how trade responds to changes in fundamentals in the short and long run. In the long run, all trade shares are efficiently allocated, so $\lambda_{ijt} = 1$ and Equation (9) boils down to Equation (1). The same applies if $\rho = 1$ and there are no frictions for countries to adjust capacity. In the short run, however, pre-existing trade relationships will affect how trade flows react to changes in fundamentals.

We estimate the dynamic gravity Equation (9) in a partial equilibrium gravity setting with three sets of fixed effects, following Anderson and Yotov (2023). The first two are the standard

[17]See Arkolakis (2010); Chaney (2014); Crucini and Davis (2016); and Anderson and Yotov (2020) for different theoretical justifications in the literature for the dynamic evolution of bilateral trade links.

[18]In this sense, the parameter is analogous to the hazard rate in sticky price macroeconomic models with Calvo-pricing.

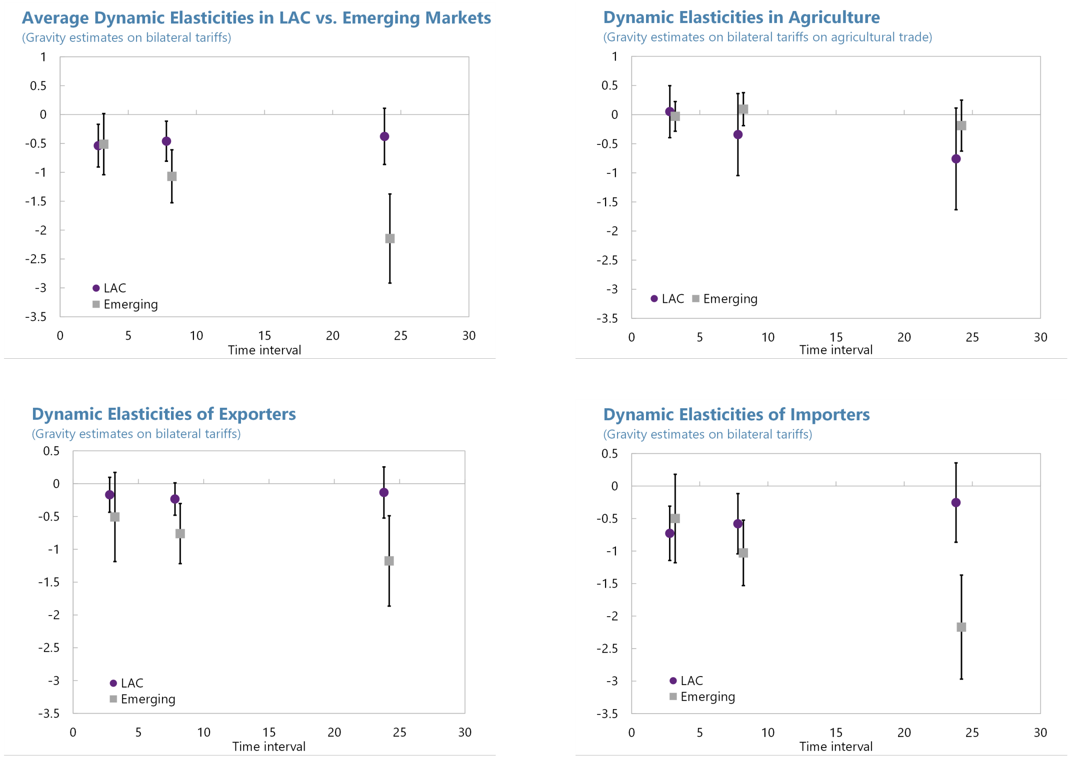


Figure 14: Dynamic Trade Elasticities to Import Tariffs

Notes: This figure plots the β_2 coefficient of the following regression: $X_{ijt} = \exp(\beta_1 RTA_{ijt} + \beta_2 \log(TARIFF_{ijt}) + \alpha_{it} + \alpha_{jt} + \alpha_{ij,\Delta_t}) \times \epsilon_{ijt}$, which is performed for LAC and for other EMDEs. Dots represent the point estimates and the bars represent 95% CIs. Top-left panel includes considers total goods trade. Top-right panel focuses on agricultural trade flows. Bottom panels focuses on cases where the region of analysis is the exporter (i) and the importer (j), respectively. *Sources:* IMF staff calculations based on Anderson and Yotov (2023).

exporter-time and importer-time fixed effects to control for any exporter-specific and importer-specific and time-varying characteristics that may affect bilateral trade flows. These include the multilateral resistance terms, output, and expenditure. The third set of fixed effects comprises exporter-importer-time interval fixed effects that control for variation in the average existing trade shares across countries, represented by $\lambda_{ijt}^{1-\rho}$.[19]

The empirical specification is as follows:

$$X_{ijt} = \exp(\beta_1 RTA_{ijt} + \beta_2 \log(TARIFF_{ijt}) + \alpha_{it} + \alpha_{jt} + \alpha_{ij,\Delta_t}) \times \epsilon_{ijt} \quad (10)$$

To estimate (10), we add a time series dimension to the data analyzed in the previous section and estimate it with the PPML estimator. To investigate regional patterns in dynamic trade elasticities, we interact the coefficient on log tariffs with regional dummies for LAC and other EMDEs.

[19] See Anderson and Yotov (2023) for a discussion on the advantages and caveats of using exporter-importer-time interval fixed effects. Boehm et al. (2023) propose an alternative "instrumented difference-in-differences" using local projections on third-country tariff shocks, and find similar magnitudes for short-run elasticities but a steeper negative slope. This is consistent with our estimates corresponding to the *average* elasticity over a given time interval whereas their methodology delivers elasticity at a specific time horizon.

Two results stand out from the top-left panel in Figure 14. First, LAC has a similar elasticity of trade to import tariffs in the short, medium, and long runs. Second, other EMDEs experience small declines in trade flows in the short run - at similar magnitudes than in LAC - but sharper declines in the long run as trade links adjust. Taken together, these results suggest that reducing import tariffs on LAC's exports will not boost trade in the long run by *as much as* in other EMDEs.

The remaining panels in Figure 14 investigate potential reasons for such differences across regions. First, the top-right panel shows that agricultural trade is less elastic over time than merchandise trade. Second, export elasticities (bottom-left panel) tend to be smaller in magnitude than import elasticities, although the difference is not statistically significant at 1 percent (bottom-right panel), particularly in the long run. These partly explain the differences in long run elasticities in LAC and peer countries as: (i) agriculture accounts for a large share of the region's trade and the LAC is on average a net exporter, differently than other EMDEs - particularly in East Asia; (ii) demand for agricultural goods less elastic than manufacturing goods; and (iii) agricultural supply is subject to environmental constraints like growing cycles.

The previous two sections have studied the potential gains for the region from lowering trade barriers, either by infrastructure improvements or by reductions in import tariffs. In what follows, we will analyze how the opposite process of increasing trade barriers amidst global geopolitical tensions affect the region, highlighting that dynamic responses and capital accumulation also play a key role.

7 Dynamic Implications of Trade Fragmentation

Risks of global fragmentation have risen in recent years. Harmful trade interventions - including discriminatory production subsidies and anti-dumping measures - have surged during the pandemic, threatening to morph into a broader policy-driven reversal of global economic integration. LAC has already faced over 800 interventions imposed by other countries but also played its part by increasing interventions imposed on other countries (Figure 15). Going forward, there is a risk that the rising trend of trade restrictions could result into a broader division of countries into economic blocs, with trade and finance ties reshaping along the bloc lines, a process some have referred to as "geoeconomic fragmentation" (Aiyar et al., 2023).

Global fragmentation could reverse gains from globalization and affect LAC through several channels. Fragmentation could disrupt both trade and financial linkages, reducing flows between blocs and re-routing them between countries in the same blocs.[20] For the world economy, including LAC, these developments could lower GDP growth, as these restrictions will likely impair capital and labor allocations and reduce technological diffusion, leading to lower productivity growth. Fragmentation could also increase barriers to migration, with potential risks to remittances flows, of which many LAC countries are large beneficiaries. Fragmentation could also harm international

[20] For instance, China provides development finance for infrastructure and energy projects in the region. See China-Latin America Finance Databases - The Dialogue for a list of projects.

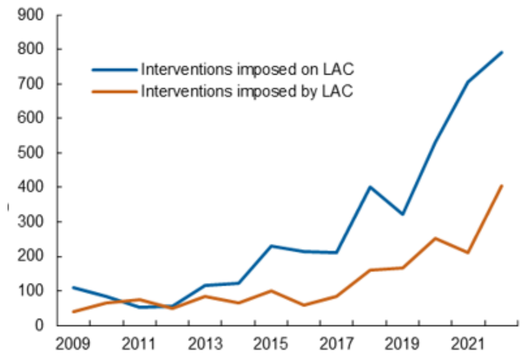


Figure 15: Blocs under Geo-economic Fragmentation Scenarios

Notes: Authors' calculations from Global Trade Alert (2022) data. Data adjusted for reporting lag as of December 31st. Interventions represent the harmful policy instrument following Global Trade Alert's classification.

cooperation on public goods such as climate change, pandemic preparedness, international taxation, as well as AML/CFT, with negative implications for LAC.

On the other hand a changing trade landscape could also provide opportunities for LAC, in particular in the manufacturing and commodities sector. In response to fragmentation prospects, companies could choose to relocate parts of their supply chain operations to countries where trade disruption risks are lower or look for alternative import sources for key commodities. While few countries in the region currently possess a competitive manufacturing base, Mexico could become a potential beneficiary of trade diversion and grow its manufacturing sector. In fact, evidence suggests that Mexico is already benefiting from some trade diversion: Mexico has supplanted China as the United States' main trading partner in 2023Q1 and investment in industrial real estate is booming.[21] For other countries, there could be selective opportunities to expand in specific manufacturing sectors such as medical or IT devices in Costa Rica or Dominican Republic.

LAC's fossil fuel, mineral, and agricultural producers could also benefit from a reorientation of demand as well as temporarily higher commodity prices. While commodity markets are prone to shocks that could be amplified by geoeconomic fragmentation,[22] LAC's vast resources of the minerals critical for green technologies and decarbonization, such as lithium, silver, and copper, make it a central player courted by advanced economies seeking to secure supplies of critical minerals.[23] With the appropriate policy frameworks, these resources could attract substantial investments.

[21]See Fajgelbaum and Khandelwal (2022) for a survey of the economic impacts of the US-China trade war. See also Cigna et al. (2022) and Wang and Hannan (2023) for a product-level analysis of trade diversion after the US-China trade war.

[22]Commodities, which account for a large share of LAC's trade, are already showing signs of fragmentation (IMF, 2023a). The oil and natural gas markets are among those markets where signs of fragmentation have been the most salient, with large reallocation of export destinations and price spikes that have spurred bouts of inflation. Substantial uncertainty regarding medium-term forecasts of lithium demand and mining needs stems from the risk of technological breakthrough in battery production or recycling possibilities (Vasquez, 2023; Riofrancos et al., 2023).

[23]For instance, the EU and Chile signed in July 2023 a memorandum of understanding to establish a partnership on sustainable raw materials value chains.

7.1 Fragmentation Scenarios

The likely impact of fragmentation on LAC will depend on the degree of fragmentation and the shape that future trading blocks would take. Given the recent tensions, these blocs are likely to center around the US-EU and China-Russia (IMF, 2023b). There are multiple possibilities, however, of how other countries would align with these two blocs. For example, countries could align based on geopolitical views or based on trade or financial ties.

To provide a quantitative assessment, the chapter explores two kinds of illustrative scenarios—a mild scenario and two more extreme fragmentation scenarios—in a simple trade model. A mild fragmentation scenario entails full suspension of trade between Russia and US-EU while trade between China and US-EU remains open, except for high-tech sectors. Trade among other countries remains unchanged (Figure 16, left panel).[24] In this scenario, LAC maintains economic ties with the two blocs. In the more extreme fragmentation scenarios, in contrast, all trade between the US-EU and China-Russia blocs come to a halt, and other countries are forced to trade exclusively with one another within a bloc. In this scenario, countries face the stark alternative to join either US-EU or China-Russia blocs and suspend trade with the other bloc (Figure 13, panel 2). For the purpose of our analysis, we formulate two hypothetical extreme fragmentation scenarios. In one scenario, countries are assigned to either bloc based on the strength of their trade relationship with the bloc members (most LAC countries would join the US-EU bloc), and in the other scenario countries are assigned to blocs based on their geopolitical proximity.

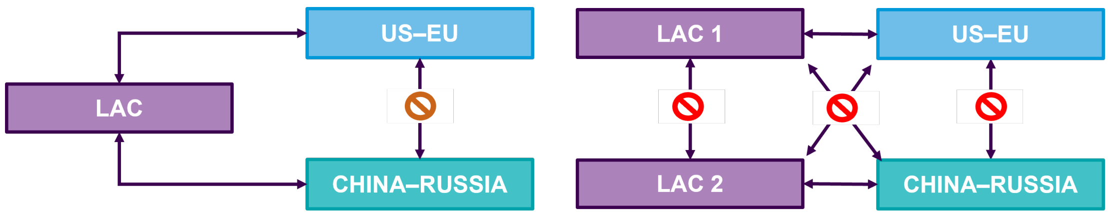
A natural way of forming blocs is to assign countries based on their current trade links. We use the share of bilateral trade in goods and services in 2019, to limit the distortions in trade flows generated by the pandemic. Countries join the bloc of whichever pair, USA and Europe on the one hand, or China and Russia on the other hand, account for the largest trade share. According to this criteria, most LAC countries would end up in the USA-EU bloc, as the rising share of trade with China has not yet surpassed the combined trade with western countries (Figure B.2). Alternative measures of proximity can be considered could be used such as geopolitical proximity as measured by distance between voting patterns at the United Nations General Assembly, see Bailey et al. (2017) or military alliances (Leeds et al., 2002). In this case, most Latin American countries' positions at the UNGA align more closely with China (Figure B.1). While we choose the strength of trade relationships to divide countries into economic blocs, countries might coalesce instead along geopolitical lines, such as the BRICS, or regional groupings. [25]

Before moving to our dynamic impact in the next subsection, we first examine the impact of these fragmentation scenarios in a simple input-output trade model, which focuses on the static misallocation costs due to trade frictions and abstract from other channels such as financial flows.[26]

[24]Following Cerdeiro et al. (2021), high-tech sectors are defined using the ISIC Rev. 3 Technology Intensity Definition (OECD, 2011), which is based on sectoral R&D intensities. This methodology highlights two high-tech sectors: electronics and machinery, and transport equipment.

[25]See also Campos et al. (2023b) for alternative blocs based on how countries voted on the suspension of the rights of membership of the Russian Federation in the United Nations Human Rights Council following the invasion of Ukraine.

[26]See Appendix A for a description of the model's main channels and Bolhuis et al. (2023) and Machado Parente



Mild Fragmentation Scenario Extreme Fragmentation Scenario

Figure 16: Possible Geo-economic Fragmentation Scenarios

LAC would weather a mild fragmentation scenario well. In fact, in a mild fragmentation scenario, changes to LAC's output would be near zero and marginally positive on average (Figure B.3). From that perspective, LAC would be better placed than advanced or other emerging economies, which are estimated to lose on average $\frac{1}{2}$ to 1 percent of output, relative to a world where there is no fragmentation. LAC's trade structure provides two mitigating factors explaining LAC's resilience in this scenario. First, due to its export similarity with commodities exported by Russia, LAC—South American's fossil fuel and agricultural exporters in particular—can benefit from trade diversion and temporary higher prices. Second, the silver lining of LAC's limited integration into GVCs (Figure 4) is that severing trade between EU-US and China in the high-tech has little impact on the region's trade flows and the rest of the region's trade remains essentially unaffected in this scenario.

More extreme fragmentation scenarios could result in more sizeable output losses for LAC, although still below the anticipated costs for advanced or other emerging economies. In more severe fragmentation scenarios, LAC's permanent output losses would average from 2 to 4 percent – still less than those in AEs and other EMEs. Larger output losses in these scenarios result from the stark assumption that trade between countries in opposing blocs is completely cut off. Moreover, these losses would depend on individual country characteristics. Two features of LAC economies make them particularly vulnerable. First, given that both US and China account for large shares of LAC's trade (Figure B.3), alignment with either bloc would necessarily imply disrupting trade with a major partner, resulting in substantial losses, to the extent that these trade flows are not smoothly reallocated. This extreme global fragmentation could also result in LAC countries being separated from neighboring countries and joining opposing blocs, generating additional losses. The costs would be largest for countries that end up isolated from their neighbors.

7.2 Fragmentation Dynamics: the Capital Goods Channel

Fragmentation could also weigh down on capital investment in the region, an effect not explicitly captured by static input-output models. LAC's rate of gross fixed capital formation has persistently lagged peers and the region still faces sizeable investment needs. While globalization delivered a steep decline in the prices of capital goods, boosting real investment and productivity in most EMDEs (IMF, 2019), fragmentation threatens to reverse this trend. LAC could be particularly

and Moreau (2023) for details.

exposed given its reliance on machinery and equipment imported from China (Figure 5), with few readily available and cost-competitive alternative sources. Wacziarg and Welch (2008) document that after trade liberalisation, investment rates have increased in a sample of 118 countries. This is consistent with finding a decline in investment rates when trade tariffs increase.

To estimate how these headwinds could hamper investment, we simulate, in a simple dynamic multi-country trade model with capital accumulation, the extreme fragmentation scenario splitting the world into the two blocs described above. Our model follows Ravikumar et al. (2019), embedding a neoclassical growth model – where growth is driven by capital accumulation – into an otherwise standard trade model. As a result fragmentation now generate dynamic effects. We model various fragmentation scenarios as distortions to the bilateral trade costs as in the previous fragmentation exercise.

The basic structure is the multi-country trade model of Eaton and Kortum (2002) embedded in a neoclassical growth model with capital accumulation as in Alvarez (2017). Country i assembles a continuum of traded varieties, v, into a composite good, M_{it}:

$$M_{it} = \left[\int q_{it}(v)^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}}, \tag{11}$$

where η captures the elasticity of substitution between varieties $q_{it}(v)$.

There are three sectors: consumption, investment, and intermediates. A combination of capital (K), labor (L), and the composite good M is used in each sector in nested Cobb-Douglas production functions to produce intermediate, consumption, and investment goods, respectively:

$$Y_{mit}(v) = z_{mi}(v) \left[K_{mit}(v)^{\alpha} L_{mit}(v)^{1-\alpha} \right]^{\nu_{mi}} M_{mit}(v)^{1-\nu_{mi}} \tag{12}$$

$$Y_{cit} = z_{ci} \left[K_{cit}^{\alpha} L_{cit}^{1-\alpha} \right]^{\nu_{ci}} M_{cit}^{1-\nu_{ci}} \tag{13}$$

$$Y_{xit} = z_{xi} \left[K_{xit}^{\alpha} L_{xit}^{1-\alpha} \right]^{\nu_{xi}} M_{xit}^{1-\nu_{xi}}. \tag{14}$$

where $\{z_{ci}, z_{mi}, z_{xi}\}$ denote country- and sector-specific productivity shifters, $\{\nu_{ci}, \nu_{mi}, \nu_{xi}\}$ capture the relative importance of intermediate goods in each sector, and α denotes the relative importance of capital in value added.

Capital accumulation is subject to depreciation at rate δ and adjustment costs, controlled by paramater λ:

$$K_{it+1} = (1-\delta) K_{it} + \delta^{1-\lambda} X_{it}^{\lambda} K_{it}^{1-\lambda} \tag{15}$$

and it is assumed there are no adjustment costs in steady state ($X_i^* = \delta K_i^*$). We rewrite Equation (15), expressing the required investment needed for a given change of the capital stock:

$$X_{it} = \Phi\left(K_{it+1}, K_{it}\right) = \delta^{\frac{1-\lambda}{\lambda}} \left[K_{it+1} - (1-\delta) K_{it} \right]^{\frac{1}{\lambda}} K_{it}^{\frac{\lambda-1}{\lambda}} \tag{16}$$

In steady state, the capital intensity $k_i = \frac{K_i}{L_i}$ is inversely proportional to the price of investment goods, P_{xi},

$$\frac{K_i}{L_i} = \frac{\alpha}{(1-\alpha)\left(\frac{\Phi_1}{\beta} + \Phi_2\right)} \frac{w_i}{P_{xi}} \tag{17}$$

where β is the period discount factor, Φ_1 and Φ_2 are constants characterizing the first derivatives of the adjustment cost function with respect to the first and second argument, and w_i is the equilibrium wage. A key feature of trade data is that investment goods are more trade intensive than consumption good. When estimating the model, this results in $1-\nu_{xi} > 1-\nu_{ci}$. As a result, the price of investment goods are more sensitive to trade fragmentation than wages and the steady state capital intensity falls, which explains the potency of the dynamic channel. In equilibrium, the investment rate of a given country respond negatively to increases in trade costs.

The model is calibrated using the latest available input-output trade data from WIOD for trade data, the Penn World Table 10 for capital stocks, and CEPII for gravity variables. We include LAC's five largest economies as well as 38 other economies and the rest of the world, which aggregate all the remaining economies. As in the previous exercise, we consider fragmentation scenarios, modelled as trade cost shocks to the bilateral trade matrix. In the baseline scenario, countries are assigned to either the US-EU or China bloc depending on which one of the two is their larger trading partner.

The analysis suggests that investment rates in LAC's largest economies could drop by 2 to 5 percent, hitting particularly Mexico and Brazil (Figure 17)—countries with more capital-intensive industries—with the capital intensity in these economies gradually faltering compared to a baseline with no fragmentation. This suggests a substantial impact of fragmentation on investment, which can amplify output losses due to extreme fragmentation by about 40 percent, compared to a simulation of the same extreme fragmentation scenario when the investment channel is shutdown. Additionally, evidence suggests that investment, and FDI in particular, can also be negatively affected by the policy uncertainty associated to fragmentation risks (IMF, 2023b).

Strengthening trade integration and policy coordination among LAC countries would help limit the impact of fragmentation. From a global welfare standpoint, a first-best scenario is naturally to avoid fragmentation. However, with rising risks of global fragmentation, LAC countries may need to focus on a strategy that pursues greater integration while mitigating the potential costs from global fragmentation. Deepening intra-regional trade integration and fostering regional coordination would go in this direction, helping to boost trade and increase opportunities for diversification to minimize the risks from global fragmentation. While nonalignment with either bloc can help limit the risk of a costly intra-regional division into opposite blocs and place the region in a stronger footing in trade negotiation vis-à-vis large economies, it can also generate policy uncertainty that may deter FDI (IMF, 2023b). Ensuring a more robust WTO able to handle trade disputes could also help maintain openness and predictability in the international trade system.

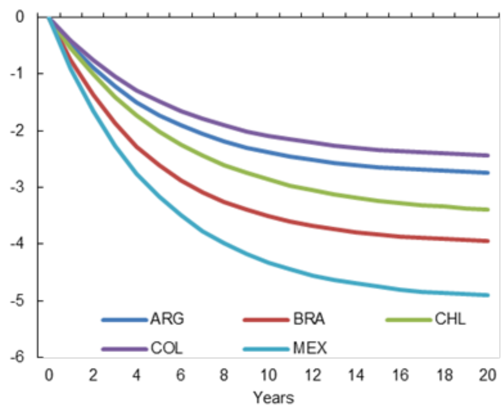


Figure 17: Impact of Fragmentation on Capital Intensity in LA5 countries over time

Notes: Percent Losses in Capital to output ratio compared to baseline after trade is fragmented into blocs, relative to the capital-to-output in the baseline equilibrium with no fragmentation. Authors' calculations using data from version 10 of the Penn World Table, the World Input Output Database and from CEPII. See Ravikumar et al. (2019) for details on mapping the data to the model.

8 Concluding Remarks

This paper documents the evolution of trade in LAC and analyses the implications of recent trade policies. LAC's degree of trade integration lags that of many other regions. The region's exports have remained concentrated in a few sectors, with China recently becoming a key trading partner on par with the US and Europe. China has also become the main supplier for capital goods and has played an increasing role in infrastructure and energy projects (Myers and Ray, 2023).

While tariffs in LAC have generally tracked the declining global trend, the response of LAC's import and export flows has been more muted that in EMDEs, particularly in the long run. Remaining gaps in infrastructure and, in some cases, low quality of governance and human capital have also contributed to LAC's low degree of trade integration (Bhattacharya and Pienknagura, 2024), and point to the potential for substantial gains from improving transport- and customs-related infrastructure. Services trade, currently low in the region, could also offer LAC a chance to deepen trade integration without having to cope with large and costly upfront investments. Barriers to services trade include high foreign equity restrictions, differing licensing requirements and building codes, and limitations on the movement of foreign professionals (OECD, 2024).

New challenges to the global trade landscape are emerging. Increasingly, environmental concerns are embedded in trade negotiations, complicating the implementation of trade agreements. Tariff policies are also scrutinized for a possible carbon-bias (Shapiro, 2021), and Carbon Border Adjustments could have far-reaching implications (Hufbauer et al., 2022). In a context of deepening global trade tensions, while the region could benefit from some trade diversion, it could be negatively impacted if global trade splits into competing blocs. Losing access to cheap equipment goods, most of which are imported from Asia, would also impede investment and slow growth in the medium-run.

Strengthening trade integration, including within the region, could be key to reaping the benefits of greater trade openness while mitigating the risks of global fragmentation. Reducing trade barriers, including non-tariff barriers, closing infrastructure gaps, and putting in place policies that make LAC an attractive investment destination could boost trade and growth in the region. Multilateral cooperation and trade policy coordination, including within LAC, could help reduce cross-border spillovers and trade policy uncertainty, as well as identify and mitigate unintended consequences of trade policy actions.

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A Annex: Static Geoeconomic Fragmentation Model

The impact of fragmentation on the GDP in LAC in Section 7 is first evaluated using the static trade model model with sectoral linkages in Bolhuis et al. (2023). The model features several sectors connected through input output linkages both within and between countries. These trade linkages are the main channels through which fragmentation disrupts the world economies. Fragmentation scenarios in the model are simulated by exogenously changing the trade costs. When trade costs change, countries endogenously re-allocate their exports and imports. Because fragmentation raises trade costs, it results in a misallocation of resources as some countries divert trade away from lower-cost producers when the latter are hit by higher trade costs, depressing global welfare.

Concretely, the model is built along the lines of the canonical Caliendo and Parro (2015) multi-sector trade model. The model can account for heterogeneity in sectoral composition and productivity across sectors and countries. In addition, it distinguishes between two types of good, non-commodities and commodities. Only the former can be consumed as final good while commodities are more upstream in the production process.

At a first order, the impact of fragmentation on a country's real income is a weighted average of the impact in each sector. The latter can be decomposed in three terms. A first term captures the exposure to the other bloc through trade and is proportional to share of expenditure a country has on goods in the other bloc. A second term captures the direct effect of breaking trade linkages on the goods prices. This price effect is larger for goods and commodities with lower trade elasticities (i.e., that are harder to substitute). Finally, a third term captures indirect, amplification effects through input-output linkages. As a result, ceteris paribus, disruption in commodities markets can have larger effect as shocks propagates downstream to the goods for which these commodities serve as input.

As a result, countries that are more tightly integrated to global trade and participate in GVCs that span the competing block are more severely impacted by fragmentation, as well as countries buying commodities with low trade elasticities produced in the other bloc. Conversely, countries that produce hard-to-substitute commodities are hurt the least.

Trade elasticities play a key role in the results and Bolhuis et al. (2023) conduct robustness exercises using the range of estimates in the literature. Finally, it should be stressed that, while the extreme fragmentation scenario relies on the stark assumption of a full partition of trade into two blocs, the model also abstracts from other important channels such as financial linkages, migration, or technological spillovers. Disruption of these additional channels could further compound the cost of fragmentation.

B Annex: Additional Figures

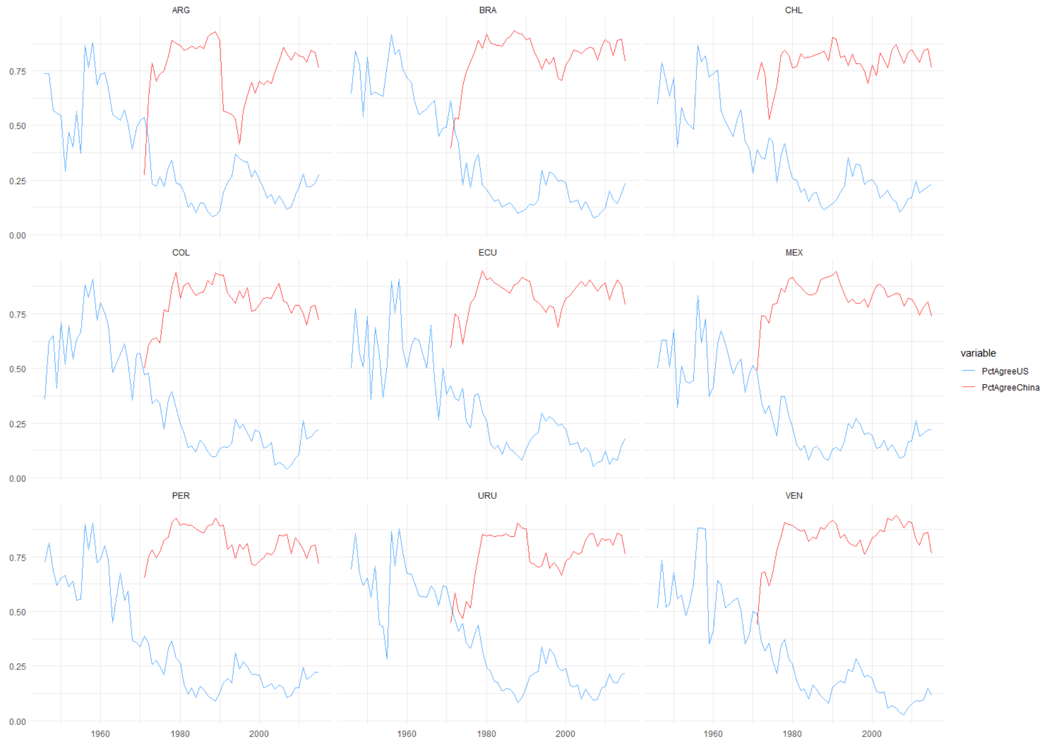


Figure B.1: Geopolitical Proximity based on UNSG voting patterns

Notes: Author's calculations using United Nations voting data from Bailey et al. (2017).

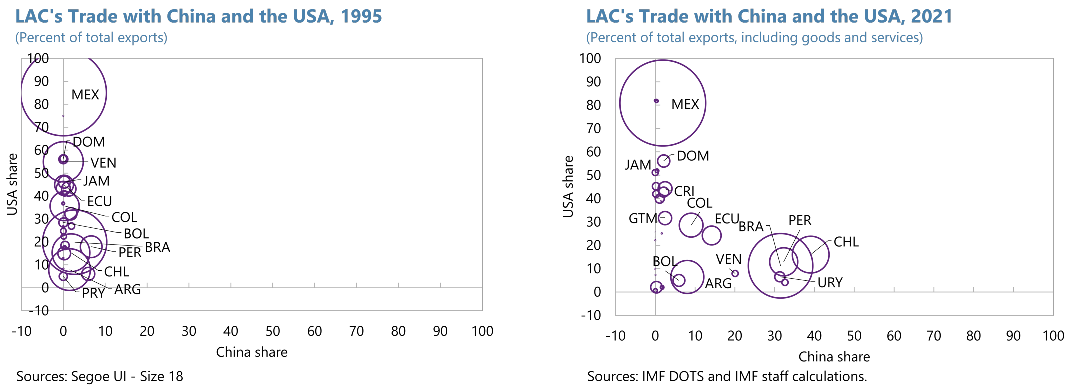
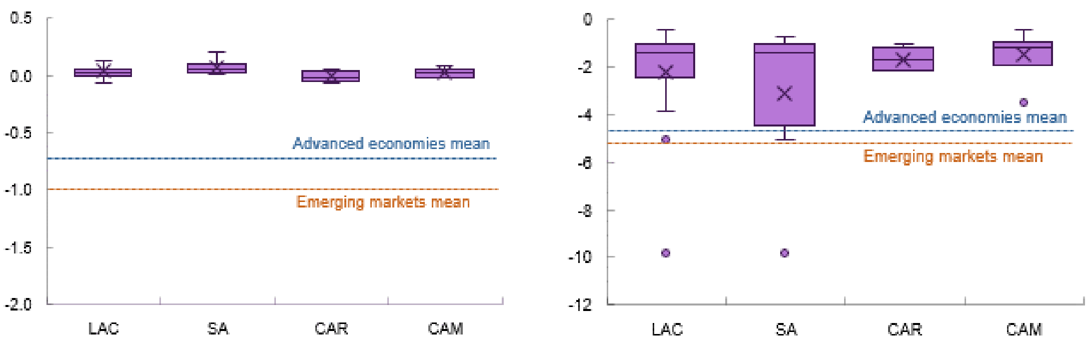


Figure B.2: Share of US and China trade among LAC countries, in 1995 and 2021

Notes: Author's calculations using COMTRADE data. The size of the bubbles are proportional to the size of the country's GDP.



Mild Fragmentation Extreme Fragmentation

Figure B.3: Impact of Geo-economic Fragmentation in Static model

Notes: Impact on GDP for group of countries, compared to a baseline scenario where there is no fragmentation. CA = Central America; CAR = Caribbean; SA = South America. Emerging markets refer to EMDEs excluding Low Income Countries. The horizontal lines in the bars represent the median, for the countries in the group, the cross the average, the bars the interquartile range, the whiskers the min and max, except for outliers (dots) lying outside 1.5 times the interquartile range away from the median. See main text for the description of the two scenarios.

PUBLICATIONS

The Dynamics of Trade Integration and Fragmentation in LAC Working Paper No. [WP/2024/253